

REMARKS

Pursuant to the restriction requirement, Applicants hereby elect Group I, claims 16-65, 71 and 72 for further prosecution. Claims 66-70 stand withdrawn from consideration.

By this amendment, claims 16, 25 and 34-37 are amended. Independent claims 16 and 25 have been amended to correct a minor typographical error. Further, in claim 25, the term "rare" has been replaced by "rare gas" as suggested in the Office Action, and in claims 34-37, the pressure "3133 Pa" has been replaced by the pressure range "3 to 133 Pa" as disclosed, for example, at page 22, line 14 of the specification. Claims 16-59, 71 and 72 are presented for further examination.

The objections to claims 25 and 34-37 and the rejection of claims 34-37 under 35 U.S.C. § 112, first paragraph, are believed overcome by the foregoing amendments to these claims. No further corrections are believed necessary.

Initially, while claims 42-47 are listed in the Office Action Summary as rejected, the Detailed Action fails to include any reason for the rejection of these claims. Repeated attempts to contact the examiner to clarify this point were not answered.

The rejection of claims 16-22, 25-31, 54, 55, 64, 65, 71 and 72 under 35 U.S.C. § 103(a) over Ohmi, US 2002/0014666 (Ohmi I), in view of Wolf, Silicon Processing, Vol. 1 (Wolf I), in further view of Mintz, US 5,618,282 is respectfully traversed.

Independent claims 16 and 25 each relate to a multi-step process for forming insulating films comprising a first step of cleaning a substrate with plasma based on a first process gas comprising at least a rare gas, and a second step of forming an oxide film (claim 16) or a nitride film (claim 25) using plasma and a second process gas comprising at least a rare gas and oxygen (or nitrogen), wherein the first and second steps are conducted under the same operation principle.

The combination of references fails to teach or reasonably suggest all of the claim limitations. Ohmi discloses a film formation step whereby a silicon oxide film is formed on a silicon substrate using plasma containing Kr gas and an O₂ gas (paragraphs 90-95). However, as acknowledged in the Office Action, Ohmi does not disclose a rare gas plasma cleaning step much less a plasma cleaning step prior to film formation wherein the cleaning and the film formation are conducted under the same operation principle.

Ohmi discloses only that a silicon substrate can be cleaned via an HF or RCA etch, both of which are wet chemical cleaning techniques and **cannot** be carried out under the same operation principle as the plasma-induced film formation step (see, e.g., paragraphs 104 and 105).

The secondary references of Wolf I and Mintz do not remedy the deficiencies of Ohmi. Wolf I merely teaches that wafer cleaning is desired, yet complex. Mintz discloses that a plasma wafer cleaning process can use gases such as argon, hydrogen and gas mixtures that include a fluorine-containing gas

(see column 6, lines 15-23). Even assuming *arguendo* that the combination of Mintz and Wolf I with Ohmi might suggest incorporating a plasma cleaning step prior to a film formation step as recited in claims 16 and 25, the combination of references does not reasonably suggest conducting the first (plasma cleaning) and second (plasma-induced oxidation or nitridation) steps under the same operation principle.

According to the invention, the surface of a substrate can be subjected to plasma cleaning prior to film formation in order to remove a native oxide film and other organic contamination. By conducting the film formation step under the same operation principle as the cleaning step (i.e., in the same vessel without exposure of the substrate to air), the effects of organic contaminant removal and native oxide removal can be optimally maintained (see, e.g., page 12, line 23 through page 13, line 14 and page 21, lines 19-23 of the specification).

While the reactor of Mintz can be used for soft etch, cleaning or plasma enhanced CVD processes, Mintz does not teach or suggest conducting multiple processing steps sequentially in the same reactor, much less under the same operation principle.

Mintz does disclose the use of a serial wafer fabrication system (column 4, lines 66-67). In the only example of conducting multiple processes, however, Mintz teaches that only a single etch step is conducted in the reactor and that by limiting the etch step to 40 seconds, the "etch step duration plus system overhead to transfer wafers into and out of the reactor meets a system

throughput requirement.” Thus, Mintz merely teaches a plasma-based cleaning step and does not teach or suggest following the plasma cleaning step with a plasma film formation step that is conducted under the same operation principle.

Because the cited references, considered in any combination, fail to teach or suggest a first step of cleaning the substrate with plasma and a second step of oxidizing (or nitriding) the substrate with plasma, wherein the first and second steps are conducted under the same operation principle, reconsideration and withdrawal of the rejection are respectfully requested.

The rejection of claims 23, 24, 32, 33 and 56-59 under 35 U.S.C. § 103(a) over Ohmi, Wolf I and Mintz in further view of Wolf IV, the rejection of claims 34-37 under 35 U.S.C. § 103(a) over Ohmi, Wolf I and Mintz in further view of Kern, Handbook of Wafer Cleaning Technology, the rejection of claims 38-41 under 35 U.S.C. § 103(a) over Ohmi, Wolf I, Mintz and Kern in further view of Cohen, US 2002/0009892, the rejection of claims 48-51 over Ohmi, Wolf I and Mintz in further view of Rossnagel, Handbook of Plasma Processing, the rejection of claims 52 and 53 under 35 U.S.C. § 103(a) over Ohmi, Wolf I and Mintz in further view of Ohmi, US 6,357,385 (Ohmi IV), and the rejection of claims 60-63 under 35 U.S.C. § 103(a) over Ohmi, Wolf I, Mintz and Wolf IV in further view of Hallyal, US 6,451,641 are respectfully traversed.

Claims 23, 24, 32-41, 48-53 and 56-63 depend either directly or indirectly from independent claims 16 and 25 and thus are patentable at least for the reasons that claims 16 and 25 are patentable.

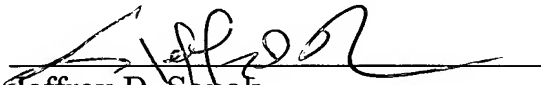
In view of the foregoing, the application is respectfully submitted to be in condition for allowance, and prompt favorable action thereon is earnestly solicited.

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned at (202) 624-2995 would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #101249.55459US).

Respectfully submitted,

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